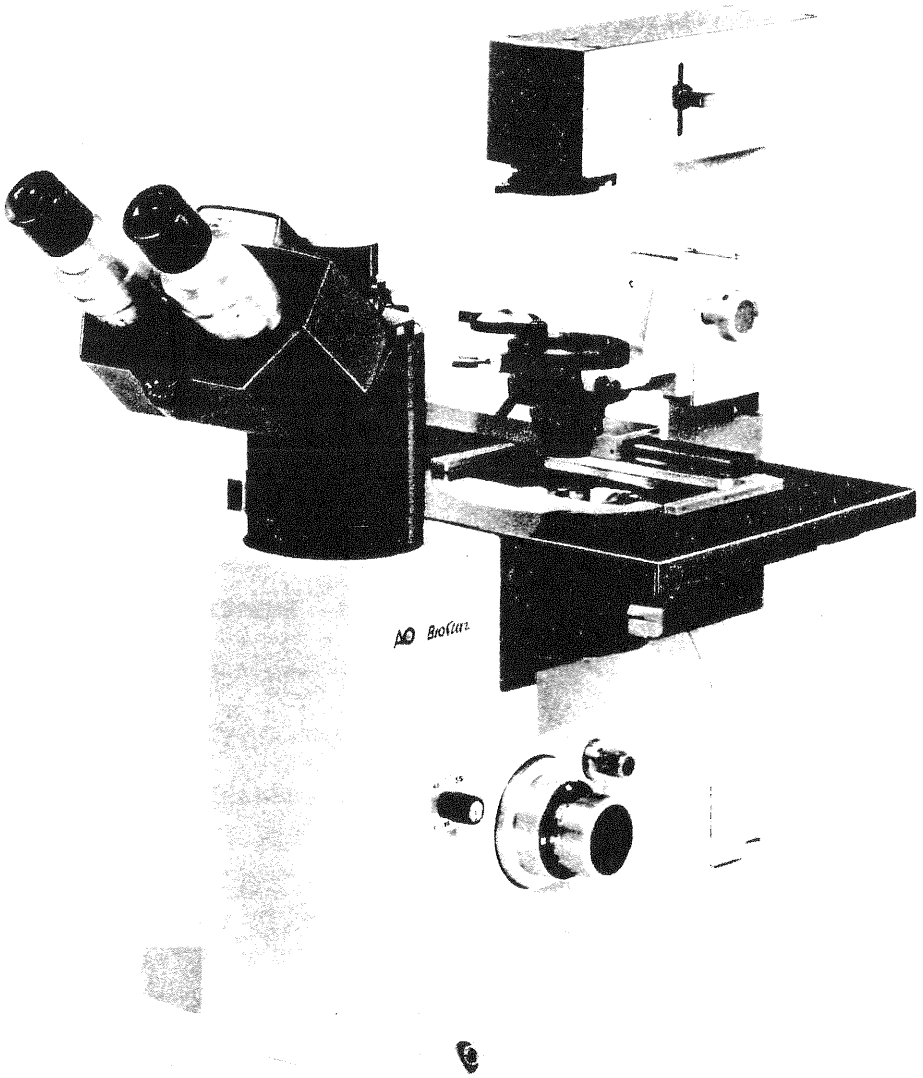
# Series 1820 BIOSTAR®
# INVERTED BIOLOGICAL MICROSCOPE

## SERVICE MANUAL



This Service Manual does not necessarily contain information on all changes that have occurred to the subject instrument since the manual's date of issue. It was prepared for the use of American Optical factory-trained service personnel who are kept up to date through a program of Service Bulletins and Training Seminars.

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TSM-56-2 4/80

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## I COARSE AND FINE ADJUSTMENT ASSEMBLY

Reference: 1820-800 Drawing

### A. Removal of Coarse and Fine Adjustment Assembly

1. Drill a small hole in each FA knob cap (110-49) slightly off center. Insert a hook type tool and pull the caps off.
2. Remove both small truarc retainers (X50972) from each end of the fine adjustment shaft.
3. Remove both fine adjustment knobs (110-9) and 110-10).
4. Remove the flat washer (11330-180) and spring washer (X50462) from each side of the fine adjustment shaft.
5. Remove the plain head screw (110-80) and knob lock (110-33) from the right-hand CA knob (early models only). 110-83 set screw on later models.
6. Remove the screw (X26112) and knob lock (110-33) from the left-hand CA knob (early models only).
7. Remove the large truarc retainer (X50473) from the coarse adjustment tube on the right side.
8. Remove any spacer washers (110-18) from the CA tube right side.
9. Loosen the two set screws (110-83) in the right-hand CA knob (110-31) and remove the right CA knob.
10. Remove the spring washer (110-62) and flat washer (110-16)on the right side.
11. Remove the large truarc retainer (X50473) from the coarse adjustment tube on the left side.
12. Remove any spacer washers (110-18) from the CA tube on the left side.
13. Loosen the two set screws (110-83) and remove the left-hand CA knob (110-11) with stop pin (110-7).
14. Remove the large flat washer (110-16) from the CA tube on the left side.
15. Remove the two fiber bearings (110-15) from both sides of the CA tube.
16. Remove two screws (570-61) holding the bearing adapter (110-81) and remove the left-hand adapter.

    NOTE: This (110-81) bearing adapter has a stop molded in it. Mark the position of this molded stop to the stand.
17. Remove the(1820-856) coarse and fine adjustment assembly from the left side.

    NOTE: The gear train clearance cutout in the stand on the left side.

## B. Replacing the Coarse and Fine Adjustment Assembly

1. Lubricate:

    a. The bearing surfaces of the cam (110-42) with Dow-Corning 44.

    b. The fine adjustment shaft (1820-23) in the area of the bushings (110-43) if necessary with AO 777.

    c. The gear box bearings with Ucon LB 300X liquid.

2. File off set screws' burrs on the coarse adjustment tube (1820-24) and insert the assembly (1820-856) through the stand from the left side, through the gear box cutouts, and through the bearing adapter (1820-74) on the right side. The gear box must be on the left side of the stand.

    NOTE: a. The gear (1820-37) on right is used for auto-stop. This gear is not included with a stock 1820-856 assembly.

    b. The bearing adapter (1820-74) on right has a cutout at 3:00 o'clock position for adjusting screw in stand.

3. Replace the bearing adapter (110-81) on the left side with the molded stop at the 10:00 o'clock position. Fasten in place with two screws (570-61).

4. Replace the bearings (110-15) on each side of the stand. The slot in the bearing engages a mating rib in the bearing adapters.

5. Replace the flat washer (110-16) and plain CA knob (110-11) on the left side.

    NOTE: Do not tighten the knob set screws (110-83).

6. Replace any spacer washers (110-18) if required, and the large truarc retainer (X50473) on the left side of the CA tube.

7. Replace the large flat washer (110-16), the spring washer (110-62) and the calibrated CA knob (110-12) on the right side.

    NOTE: Do not tighten the knob set screws (110-83).

8. Replace any spacer washers (110-18) if required, and the large truarc retainer (X50473) on the right side of the CA tube.

9. Tighten the two set screws (110-83) in the right CA knob. Rotate the right-hand fine adjustment and coarse adjustment clockwise, (away from binocular body), to lower the nosepiece until the lever assembly (110-852) disengages from the cam.

10. Rotate the left-hand fine adjustment clockwise (toward the binocular body) to its stop.

11. Lay the instrument on its left side with the illuminator switch facing up.

12. Turn the fine focus full counterclockwise.

13. Turn the right-hand coarse adjustment three to four turns clockwise while pushing down on the nosepiece and stop with the set screw in the gear box of the CA/FA facing the base of the stand.

14. Lift the stand slightly and shake or drop onto its left side which will cause the lifting lever and ball to fall onto the coarse adjustment cam. Be sure to use a pad to protect the finish on the stand.

15. Slowly turn the right-hand coarse adjustment knob counterclockwise until the nosepiece raises. Continue turning the knob to the stop position. If the nosepiece does not engage, repeat Steps 13 and 14 or reach in by hand and place fingers to the left of the coarse adjustment cam (directly below the body). Engage the lifting lever with the cam as the right-hand coarse adjustment is turned counterclockwise.

16. Place the instrument upright. The right-hand coarse adjustment is full counterclockwise to the adjustable stop and the nosepiece lifting arm is engaged with the coarse adjustment cam. There should be about a one half inch movement of the nosepiece when lifted by hand.

17. Rotate the auto focus stop knob clockwise to its stop position.

18. Turn the right-hand coarse adjustment knob counterclockwise while lifting the nosepiece up and down until there is only about a 2mm movement of the nosepiece - STOP.

19. Rotate the left-hand coarse adjustment knob clockwise to its stop position and tighten the two lock screws.

20. Replace screws (X26112), (110-80) and knob lock (110-33) into both CA knobs (early model only). (110-83) set screw on later models.

21. Replace the spring washer (X50462) and flat washer (11330-18) on FA shaft on both sides of the stand.

    NOTE: The number of spring washers (X50462) determines the FA knob tension.

22. Replace the fine adjustment knobs:

    Right Side - Engraved Knob (110-9)
    Left Side - Plain Knob (110-10)

23. Replace the truarc retainer (X50972) on each side of the FA shaft. Depress the FA knob against the spring washer and insert truarc retainer into the groove on the shaft and be sure it snaps into the groove.

24. Clean the face of both FA knobs.

25. Fasten new decorative discs to each FA knob.

26. Replace light shield (1820-54).

SERVICE NOTE: Continued removal of truarc retainers can cause them to become spread open too far to be effective. In this case they should be replaced.

## II MECHANICAL STAGE

Reference: 1825-800 Drawing

### A. Removal of Mechanical Stage from Plate

1. Loosen the two thumb screws (1825-15) on the underside of the stage plate.

2. Lift off the mechanical stage.

### B. Disassembly of Mechanical Stage into Assembly Groups

1. Control Assembly (1825-854)

    a. Remove the three Allen screws (X26112) with a 7/64 Allen wrench.

    b. Lift out the control.

2. E-W Slideway

    a. Remove the two screws (1825-12) in the main frame mount.

    b. Lift off the slideway.

3. Frame (1825-14) and mount (1825-16)

### C. Assembly of Mechanical Stage Groups

1. Place the E-W slideway on the frame and secure the two together with screws (1825-12).

2. Turn the mechanical stage up side down

    Place the control assembly (1825-854) into the opening in the frame. Secure the control with three Allen screws (X26112). Use a 7/64 Allen wrench.

3. Move the control so that the pinions engage with each rack. Tighten the hold-down Allen screws.

4. The control should operate with a smooth, snug and even motion with no backlash.

5. Mount the mechanical stage on stage plate with thumb screws (1825-15). Adjust E-W slideway for equal clearance across stage.

### D. Disassembly of Stage Control (1825-851)

Reference: 1825-851 Drawing

1. Insert a 1/16 Allen wrench through the opening in control knob (1194-39) into the adjustment nut (1534-48) hole and loosen the set screw (X20600).

2. Fit spanner wrench (K2216) into the slot on control knob (1194-39). Unscrew the knob and remove it.

3. Remove:

    a. Spring Washer (1062-76)
    b. Square Washer (1534-30)
    c. Washer (1534-34)
    d. Washer (1534-31)

4. Insert a 1/16 Allen wrench through the opening in control knob (1194-40) and into the adjusting nut (1534-26) hole and loosen the set screw (X20600) and soft plug (1534-38).

5. Remove the adjusting nut (1534-26) using spanner wrench (K2216).

6. Remove:

    a. Spring Washer (X56584)
    b. Square Washer (1534-29)
    c. Nylon Washer (1534-33)

7. Remove the control knob (1194-40) and pinion (1825-2) by pulling it out of mount (1825-3) and sleeve (1825-2).

CAUTION! Do not attempt to adjust or remove screw (X36845 or sleeve (1825-4). Excessive tightening will cause a bind on the fitted sleeve (1825-4).

8. Push the inner cross motion pinion shaft (1825-1) out of the forward motion pinion shaft (1825-2).

E. Assembly of Stage Control (1825-851)

1. Clean old lubrication and dirt from all parts. Lubricate as indicated on the assembly drawing using the recommended lubricants.

2. Slide the large control knob (1194-40) and lubricated pinion shaft (1825-2) into the sleeve (1825-4).

    NOTE: The two washers (1194-36 & 1194-38) must be in place between the pinion (1825-2) and the sleeve (1825-4).

3. Slide the lubricated cross motion pinion shaft (1825-1) into the forward motion pinion shaft (1825-2).

    NOTE: The washer (1194-37) is between the two pinion gears (1825-1 and 1825-2).

4. Replace the following on adjusting nut (1534-26) and lubricate each with plastic lube:

    a. Spring Washer (X50584)
    b. Square Washer (1534-29)
    c. Washer (1534-33)

5. Turn the adjusting nut (1534-26) onto the pinion shaft (1825-2) and tighten to desired tension with spanner wrench (K2216) to a snug and smooth turning condition.

6. Tighten the 1/16 Allen screw (X20600) in the adjusting nut (1534-26) until tight.

   NOTE: The set screw (X20600) must be loosened to adjust the tension on the large control knob.

7. Push the inner pinion shaft (1825-1) with washer (1194-37) through the sleeve (1825-2).

8. Place washers into slot on small control knob (1534-48) in the following order:

   a. Spring Washer (1062-76)
   b. Square Washer (1534-30)
   c. Nylon Washer (1534-34)
   d. Washer (1534-31)

   Washers will be pre-lubricated with 801X.

9. Turn small control knob (1534-48) onto inner pinion shaft (1825-1) and tighten with spanner wrench (K2216) to a snug and smooth working condition.

10. Tighten locking set screw (X20600) through the hole in the small control knob (1194-39) with 1/16 Allen wrench.

    NOTE: The set screw (X20600) will have to be loosened to adjust tension on the small control knob (1534-39).

### F. Disassembly of Stage Control (1825-854)

Reference: 1825-854 Drawing

1. Remove tension nut (1194-46).

2. Remove control knob (1194-45).

3. Remove:

   a. Spring Washer (1062-76)
   b. Square Washer (1194-47)
   c. Washer (1534-34)
   d. Washer (1534-31)

4. Insert a 1/16 Allen wrench through the opening in knob (1194-40) and into the adjusting nut (1194-49). Loosen the set screw (X20600) and soft tip (1534-38).

5. Remove the adjusting nut (1194-49) using spanner wrench (K2216).

6. Remove:

   a. Spring Washer (X56584)
   b. Square Washer (1194-48)
   c. Nylon Washer (1534-33)

7. Remove the control knob (1194-40) and pinion (1825-4) by pulling it out of mount (1825-3) and sleeve (1825-2).

CAUTION! Do not attempt to adjust or remove screw (X36845) or sleeve (1825-4). Excessive tightening will cause a bind on the fitted sleeve (1825-4).

8. Push the inner cross motion pinion shaft (1825-1) out of the forward motion pinion shaft (1825-2).

## G. Assembly of Stage Control (1825-854)

1. Clean old lubrication and dirt from all parts. Lubricate as indicated on the assembly drawing using the recommended lubricants.

2. Slide the large control knob (1194-40) and lubricated pinion shaft (1825-2) into the sleeve (1825-4).

   NOTE: The two washers (1194-36 & 1194-38) must be in place between the pinion gear (1825-2) and the sleeve (1825-4).

3. Slide the lubricated cross motion pinion shaft (1825-1) into the forward motion pinion shaft (1825-2).

   NOTE: The washer (1194-37) is between the two pinion gears (1825-1 & 1825-2).

4. Lubricate the following washers and place onto the control shaft (1825-1) along with the tension nut (1194-49):

   a. Spring Washer (X50584)
   b. Square Washer (1194-48)
   c. Washer (1534-33)

5. Turn the adjusting nut (1194-49) onto the pinion shaft (1825-2) and tighten to desired control tension with spanner wrench (K2216) to a snug and smooth turning condition.

6. Tighten the 1/16 Allen screw (X20600) in the adjusting nut (1194-49) until tight.

   NOTE: The set screw (X20600) must be loosened to adjust the tension on the large control knob.

7. Push the inner pinion shaft (1825-1) with washer (1194-37) through the forward motion pinion shaft (1825-2).

8. Lubricate and place washers into slot on small control knob (1194-46) in the following order:

   a. Spring Washer (1062-76)
   b. Square Washer (1534-31)
   c. Nylon Washer (1534-34)
   d. Washer (1534-31)

9. Turn small control knob (1194-45) onto the inner pinion shaft (1825-1) and tighten to a snug and smooth working condition.

10. Replace the lock nut (1194-46).

## H. Disassembly E-W Cross Slide

Reference: 1825-800 Drawing

1. Remove specimen holder assembly (1825-853)

    a. Take out screws (X38017)

    b. Lift off holder

2. Remove the four screws (1534-41) holding the rail (1825-8) to the top (1825-6).

CAUTION! This slideway operates on ball bearings that can fall out when the rail and slideway are separated.

Remove these parts in order as listed:

- a. Rail (1825-8) from the top (1825-6)
- b. Ball Bearings(8) (B35-14)
- c. Ball Bearing Separator (1825-20)
- d. Cross Slide Assembly (1825-852)
- e. Ball Bearing Separator (1825-20)
- f. Ball Bearings (8) (B35-14)
- g. Top (1825-6)

## I. Assembly E-W Cross Slide

Reference: 1825-800 Drawing

1. Before assembly clean all parts and lubricate.

2. Place parts together in the following order:

    - a. Top (1825-6)
    - b. Separator for Ball Bearings (1825-20)
    - c. Ball Bearings (B35-14)
    - d. Cross Slide Assembly (1825-852) with rack on the down side to right
    - e. Separator for Ball Bearings (1825-20)
    - f. Ball Bearings (B35-14)
    - g. Rail (1825-8) held in place with four screws (1534-41)
    - h. Tighten screws after compressing all parts together.

    NOTE: The cross slide should move free and smooth with no side play.

3. Install specimen holder assembly (1825-853). Secure holder to arm with two screws (X38017).

## J. Disassembly of Frame (1825-14) and Mount (1825-16)

Reference: 1825-800 Drawing

1. Remove four screws (X38005 & X37993) on the mount (1825-16).

CAUTION! This slideway operates on ball bearings that may fall out when the screws are removed and gib (1825-18) is loose; handle with care.

NOTE: Second screw (X37993) from left is longer and operates as a stop screw.

2. Push gib (1825-18) out with separator and ball bearings on it. Remove the loose parts.
3. Lift mount (1825-16) off the frame (1825-14) leaving separator and ball bearings on the frame.
4. Remove the ball bearings and separator.

## K. Assembly of Frame (1825-14) and Mount (1825-16)

Reference: 1825-800 Drawing

1. Clean all parts to remove old grease and dirt. Inspect wire tracks (1825-19) for imperfections.
2. Lubricate upper and lower ball tracks on frame.
3. Place one ball separator (1825-20) on lower track of frame (1825-14). Fill separator with 8 ball bearings (B35-14).
4. Lubricate ball tracks on gib (1825-18), then place one ball separator (1825-20) onto the gib. Fill separator with 8 ball bearings (B35-14).
5. Lubricate the ball tracks on the mount (1825-16). Place the mount on top of the ball bearing on lower track of the frame and hold the frame and mount together with left hand.
6. Slide the gib (1825-18) in opening between frame and mount.
7. Raise the gib up so the ball bearings on the gib are engaged in the upper track (1825-19) of the frame. Hold the gib up in place and insert a screw into a hole of the mount in line with the gib and secure the gib to the mount. Put screws in other three holes and tighten. Adjust gib up or down so that the mount will move free and smooth with no side play in the frame.

NOTE: Second screw (X37993) from left is longer and is used as a stop screw.

## III ILLUMINATION SYSTEMS

Reference: 1820-800 Drawing
1839-800 Drawing
1820-859 Drawing

Illumination for the 1820 BioStar Tissue Microscope is accomplished in two ways:

1. With a built-in, Overhead Halogen Lamp with optics.

2. With an Oblique Illuminator 1839 on an adjustable arm for use with over size specimens, such as large flasks, that prevent the use of the Halogen Illuminator.

### A. Preliminary Procedure

The Halogen Illuminator on the 1820 Tissue Scope is a built-in unit. It is composed of a controlled, low voltage power supply, a Halogen Lamp and an optical system to align the light in an overhead position.

To perform maintenance on this Illuminator, two sections will have to be uncovered.

1. Section One

   a. Tip Tissue Scope over on side and remove four screws (X38033).

   b. Remove base cover (1820-53).

   c. This will expose transformer, PC Board and power control switch.

2. Section Two

   On Illuminator Assembly 1820-859:

   a. Remove four screws (0862-54).

   b. Remove cover (1820-20) lamp parts exposed.

### B. Power Supply

Reference: 1820-800 Drawing
Power Supply Hand Drawing

The power supply is composed of three major parts. A transformer for step-down power, PC Board and Potentiometer to control and vary the power, and two sockets as outlets where lamps may be attached to give the proper light intensity to illuminate a specimen on the Microscope stage.

1. Removal of Transformer

    a. Unsolder pairs of wire connections:

        i. Red - to lamp connector(1138-13)

        ii. Orange - to extra power outlet (1066-19)

    b. Disconnect two black wires at solderless connector.

    c. Remove two screws (X53425) and lock washers (X16334) holding transformer.

    d. Lift off transformer (1130-30).

2. Installing Transformer

    a. Clean off excess solder on connections of the (1138-13) and (1066-19) sockets where red and orange wires were removed. Use solder wick.

    b. Check the three sets of lead wires on transformer (1130-30) for cracked insulation or exposed wire.

    c. Place transformer (1130-30) in position with wire leads toward base.

    d. Secure transformer (1130-30) to base (1820-2) with screws (X53425) and lock washer (X16334).

    e. Secure the pairs of black wires together with solderless connectors.

    f. Place pairs of wire leads to correct parts:

        i. Red - to socket (1138-13)
        ii. Orange - to dual view power jack (1066-19)

    g. Solder each connection carefully to insure good contact using 40-60 electronic type solder.

    h. Check power operation with:

        i. Lamp in socket
        ii. Test lamp in dual view power jack
        iii. Plug power supply cord (X53034) into 110VAC receptacle.
        iv. Rotate power control (1130-42) to turn lamp on and vary intensity.

    i. A voltage check may be read at each lamp socket with a VOM.

        At red wire contacts 4.0-6.0 VAC
        At orange wire contacts 2.5 VAC

3. Removal of PC Board and Control

    a. On PC Board (1130-33) remove:

        i. Nut (X8005)
        ii. Cover two screws (X53110)
        iii. Cover (1130-20)
        iv. Insulator Board (1130-13)

    b. Unsolder the two pairs of black wires to the PC Board.

    c. Loosen two set screws. Use #50 Allen in control knob (1130-48) and lift off.

    d. Remove nut holding control to base.

    e. Lift out control and PC Board.

4. Installation of PC Board and Control

    a. Place power control into opening in base and locate the ON/OFF switch on control in the down or 6:00 o'clock position.

    b. Secure control with nut to base mount.

    c. Solder 110 VAC power cord (X53034) to points P & P.

    d. Solder black wires from transformer (1130-30) to points T & T.

    NOTE: All soldering is done with standard electronic 40-60 solder.

    e. Replace insulator board (1130-13), cover (1130-20)and nut (X8005) to fasten all parts together.

    f. Secure cover (1130-20) to base (1820-2) with two screws (X53110).

    g. Test power operation with:

        i. Lamp in socket assembly
        ii. Test lamp in dual viewing power jack
        iii. Plug power supply cord into 110 VAC receptacle.
        iv. Rotate control to turn on lamps and vary brightness of lamps.
        v. A voltage check may be read at each lamp socket with a VOM:

            At red wire contacts 4.0 - 6.0 VAC
            At orange wire contacts 2.5 VAC

    h. Replace base cover (1820-53) and secure with screws (X38033).

## C. 1820 Illuminator

Reference: 1820-859 Drawing

1. This illuminator which is in the (1820-859) overhead arm is composed of:

| | | |
|---|---|---|
| a. | Lamp | 1120 |
| b. | Lens | 1130-604 |
| c. | Mirror | 1130-605 |
| d. | Lamp Holder | 1130-858 |
| e. | Condenser & Socket Assembly | 1820-857 |
| f. | Iris Mount Assembly | 1820-858 |

2. The lamp center may be checked by removing four screws (0862-54) and lifting off the cover (1820-20) exposing the illuminator.

3. Open the field diaphragm completely.

4. Place a piece of opaque paper in front of the field diaphragm.

5. Turn on lamp.

6. Move the lamp socket in and out to observe the position of the bright spot. It should be spaced equal distant or center of the diaphragm opening.

7. Center the lamp filament (bright spot) by loosening screws (X26112) on condenser socket assembly base.

8. Move assembly to obtain bright spot in center.

9. Tighten screws.

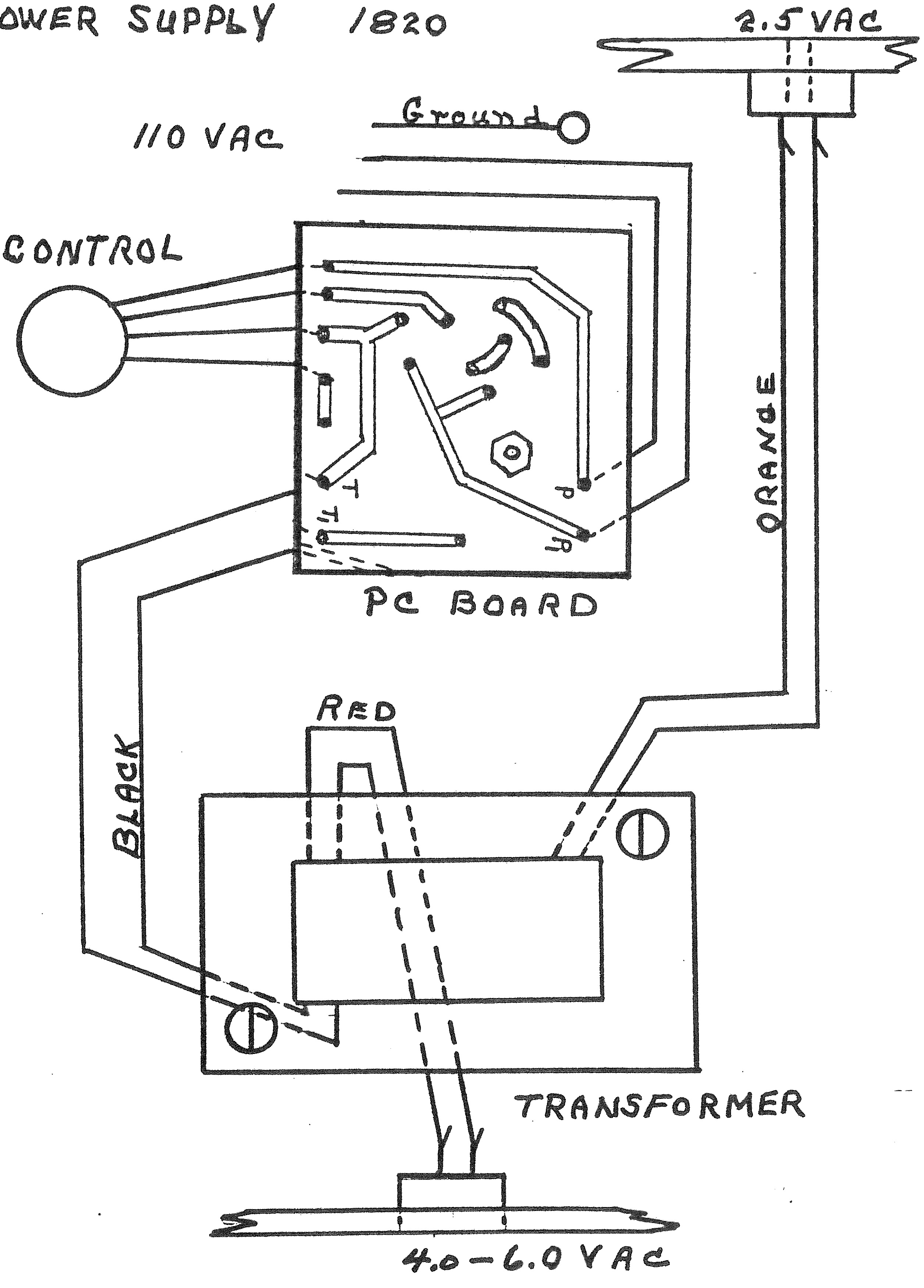
SERVICE NOTES:

1. Lamp adapter must be kept level and parallel to arm so that the lamp socket is put through opening in stand. It will center properly and not bind.

2. The illuminator assembly (1820-859) is an arm fastened to the base with two screws (1820-77) and also two alignment pins (1820-45)

3. The alignment pins (1820-45) are guided by bushings in the base (1820-47 & 1820-46) that are prealigned. Do not move these bushings!

# POWER SUPPLY 1820



## LUBRICATION LIST

Lubricants used in the production of Scientific and Ophthalmic Instruments are purchased in bulk from local Vendors and, in some cases, direct from the Manufacturer. Occasionally, various written instructions such as use manuals or service procedures refer to a specific lubricant as a recommendation only. Other types of lubricants can be used and often are due to individual preferences or because of convenient local sources.

American Optical is not in a position to furnish lubricants in either bulk sizes that would be impractical to most users or in smaller sizes due to the economics of packaging.

The following is a list of recommended lubricants in addition to the names and addresses of those sources that supply lubricants to the AO-SID manufacturing facility in Buffalo, New York.

| | | |
|---|---|---|
| 1. | DOW CORNING 44 | Dow Corning<br>3592 Lee Road<br>Cleveland, Ohio |
| 2. | UCON LB 300K | Union Carbide & Carbon Chemical Co.<br>4446 Main Street<br>Buffalo, New York |
| 3. | PLASTILUBE | Warren Refining & Chemical Co.<br>5151 Denison Avenue<br>Cleveland, Ohio |
| 4. | BRB | Mobile Oil Company |
| 5. | MOBILEGREASE #3 | P.O. Box 1007<br>Station D<br>Buffalo, New York 14210 |
| 6. | BATCO X8388A | Battenfeld Grease & Oil Company<br>Erie Avenue<br>N. Tonawanda, New York |
| 7. | MICROSCOPE AID C558A | Hanover Processing Corp., Inc.<br>P.O. Box 302<br>East Hanover, New Jersey 07936 |
| 8. | MOLYCOTE 2 | Bruening Bearings, Inc.<br>579 Sheridan Drive<br>P.O. Station B<br>Buffalo, New York 14207 |
| 9. | AO 777 | 300 gms. Batco 8388A<br>60 gms. Molycote Z<br>30 gms. Ucon Lube LB 300X |
| 10. | AO 801K | 20 parts by wt. Mobilegrease #3<br>1 part by wt. Molykote Z |